QUESTIONS:

U.S. Oil Supply: How Long Will It Last?
Conflicts in the Persian Gulf: Will It Upset the Oil Market?
Gasoline Prices: What Increases Can We Expect?

ANSWERS:

In this presentation, "World Petroleum and the Outlook for U.S. Motor Fuel Prices," Jacques R. Maroni, environmental research and energy planning director, Ford Motor Company, addresses these important issues and makes some startling predictions.

To introduce a discussion of world oil and to assess the outlook for U.S. motor fuel prices, it must be recognized at the outset that the world has a lot of oil in the ground yet to be produced... but the the U.S. is less fortunate.

At the current rate of production, U.S. proven reserves would last 9 years, OPEC reserves 70 years, and the world as a whole 34 years.

It should be made clear, however, that reserves are not a finite supply on the way to depletion. Reserves are a kind of work-in-process inventory, regularly replenished by extensions, additions and new discoveries.

The World Has a Lot of Oil, But Not the U.S.

Billions of Barrels

	1983 Production	Proven Reserves	Years of Proven Oil At Current Production Rate
U.S.	3.1	27	9
OPEC	6.4	448	70
U.S.S.R.	4.5	63	14
Rest of World	5.3	131	25
Total	19.4	669	34

Steadily improving technology, when applied to the unexplored and unrecovered resource base of the world, appears likely to keep crude oil in production for another 100 years or longer (even in the United States), although the rate of oil production is likely to decline during the next century, as other less costly fuels replace petroleum.

The principal oil-exporting countries of the world are far from the preoccupation that they may — some day — have no oil to sell. Their main concern, at the moment, is loss of market share. Then years ago, OPEC as a whole had 56% of the world oil market. Last year, OPEC's share was down to 33%.

High oil prices have stimulated competitive oil development and production all around the globe. OPEC, in fact, has lost market share not only to Mexico and England, but also to such less well-known oil producers as Egypt, Norway, Brazil and India. The Soviet Union has increased its production of oil — they are No. 1 — and will soon lead the world in natural gas production as well, creating a further threat to OPEC's fuel oil market in Europe.

In order to quadruple the price of oil from 1973 to 1981, OPEC had to reduce its crude oil output by a third — from 12 billion barrels to 8 billion barrels. Since 1981, the price of oil has declined about 24%, despite a further reduction in OPEC oil production — from 8 billion barrels to 6 billion barrels.

In the last two years, OPEC's annual revenue dropped $130 billion. In 1983, they are still some 60% better off than 10 years earlier but 43% worse off than 3 years ago. The financial squeeze is pinching some more than others.

The revenue problem is felt most severely in the High Debt countries —

Nigeria, Indonesia and Venezuela — and in countries that support wars — Iran, Iraq and Libya — where only 40% of the oil productive capacity is currently utilized.

In contrast, the Arabian peninsula countries with proven reserves that would last 100 years at the current rate — even if no new oil were ever found — are keenly interested in protecting long-term markets from the competition of cheaper fuels and from conservation measures that tend to be irreversible once undertaken by energy users.

Also showing in the spot market is the influence of changes in the level of oil inventories.

Inventories peaked around 1981 at 5.6 billion barrels. Since that time, weak oil demand, the high cost of money, and fear of an oil price collapse have combined to cause oil users around the world to cut down their exposure. Inventories have dropped to 4.7 billion barrels by 1982 and 4.2 billion barrels by the end of 1983. Inventories now appear to be stable but they are still fluctuating seasonally.

As we have seen, OPEC has lost market share and revenue. Meanwhile, OPEC members have argued over oil production ceilings, national quotas, quality grade differentials, and methods to adjust for inventory changes.

There are yet other areas of OPEC friction: Expansion of LNG export trade, the construction of new methanol plants, new export refineries and the expansion of existing refineries represent four ways that OPEC countries can improve their revenue at the expense of other OPEC members and without direct violation of OPEC rules.

Strong U.S. Dollar

World oil is priced in U.S. dollars and the dollar has been very strong in recent years in relation to European currencies. As a result, while we have enjoyed a 19% reduction in the price of oil in the U.S. from May 1981 to December 1983, there has been an increase of 18% in England, 19% in France and 23% in Italy. The strong dollar has compounded the weakness of oil demand in Europe and elsewhere by making petroleum products more expensive than ever.

Conflicts in Persian Gulf

Conflicts in the Persian Gulf area have always had the potential to upset the oil market, and still do. But, consider that they are unlikely to choke off the world oil flow for long:

$250 million per day of revenue would stop coming to the Gulf area, if oil shipments were stopped. Iran and Iraq — two major producers — have been at war for three years. Yet both have refrained thus far from taking the mutually-suicidal steps.

OPEC Has Lost Market Share

	Percent of World Oil Production			
	OPEC	Rest of Free World	Communist World	Total
1973	56%	27%	17%	100%
1983	33%	40%	27%	100%

Oil production, of course, could be increased elsewhere, notably in Mexico, Venezuela and Nigeria.

Large oil users have installed fuel-switching capability which could reduce oil demand in an emergency.

Finally, strategic oil reserves could be drawn down, if necessary.

The bottom line seems to be that even Mid-East insurgencies — the most difficult situation to deal with — would produce new rulers who would want to produce and export some oil. It has no value when left in the ground. After all, the Soviets export their own oil and gas to the West. What would they do with Arab oil, if they controlled it?

Weak Oil Demand Has Been Aggravated by Declining Oil Inventories

	Inventory Levels		
Year-End	Billion Bbl	Days' Supply	Inventory Gain/(Loss) (Million B/D)
1981	5.6	115	(1.1)
1982	4.7	102	(2.4)
1983	4.2	90	(1.3)
1984	4.1	87	(0.4)
1985	4.1	86	0

Despite the favorable outlook for oil supply worldwide, the U.S. oil outlook is more sober. Alaska and deepwater offshore can still hold pleasant surprises, but the lower 48 states have few unexplored areas likely to yield big reserves.

As a result, even if U.S. oil demand does not rise — i.e., remains at 15 million B/D — U.S. oil imports are likely to increase and could be about half U.S. consumption by 2000.

It is my opinion that the U.S. may consume 110 billion barrels of oil during the next 20 years but that U.S. reserve additions during that period will not exceed 40 billion barrels.

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Questions and Answers

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Despite U.S. inability to find oil within its borders, the prices of U.S. motor fuels have been declining since 1981. They are expected to remain essentially the same (in constant dollars) during the coming two to four years. Diesel fuel has been cheaper than gasoline, but it may lose its price advantage by 1990.

The peak fuel prices of 1981 (adjusted for inflation) are not likely to be seen again in this decade, except in the event of a war-like oil-buying panic, which appears unlikely.

Gasoline Taxes

The principal uncertainty affecting a forecast of U.S. motor fuel prices is more likely to be taxation than the value of crude oil itself.

U.S. Motor Fuel Prices Unlikely To Rise Sharply... (Unless Taxes Are Increased)

(In Constant 1983 Dollars)

	Unleaded Regular ($/gal)	Diesel Fuel ($/gal)
1981	$1.54	$1.43
1982	1.41	1.33
1984	1.32	1.25
1986	1.32	1.26
1988	1.33	1.30
1990	1.38	1.38

If and when higher fuel taxes become politically acceptable, they would:

- Revive interest in high mpg cars
- Help reduce oil import vulnerability
- Cut down the Federal Budget Deficit
- Contribute to environmental protection
- Provide revenue for new social programs (e.g., mass transit, etc.)

Public opinion polls, however, suggest that people, given a choice, would choose to ration gasoline rather than tax it, if the country had another fuel emergency.

Middle East Uncertainty

This discussion would not be complete without observations about the Middle East. It is obvious that the wide range of opinion about future oil prices reflects differing perceptions about that region of the world. Political concern about the Middle East situation will continue throughout your lifetime because the region is experiencing a crisis of identity. But if Israel were to disappear tomorrow, the region would still remain convulsed because Arab unity would become unattainable and arguments with non-Arab populations of the old Persian Empire over the disputed succession to the Prophet would fester into Holy War.

Contrary to sentimental myth, economic development — especially rapid development — is not a social panacea. Such development in itself is frequently the generator of revolution and civil war. Strangely enough, I suspect that Israel may be at the same time a cause, a symptom, and perhaps even a kind of remedy for the identity crisis of the region.

It is perhaps the greatest irony of 20th century material civilization that it is based on hydrocarbon deposits, most of which lie in a small region of the world torn by non-material issues.

Would you believe that there may be under the Middle East region half the world's oil and gas — worth perhaps $30 trillion — but the revival of Islamic Fundamentalism could be a cause greater than oil?

Here is a short list of the conflicts we could expect in the Middle East if Israel had disappeared — and no longer served to prevent some of them because it is a common enemy. Some of these conflicts will occur in any event.

Fortunately, the number of events that can reduce the oil flow is much smaller than the number of potential conflicts.

Potential "Mid-East" Conflicts *

External Wars	Internal Wars	Revolutions
Iran vs. Iraq	Christians vs. Moslems	Mercenaries
Libya vs. Egypt		
Libya vs. Sudan		
Libya vs. Tunisia	Moslems vs. Kurds	Guest Workers
Syria vs. Jordan		
Saudi Arabia vs. S. Yemen		
Egypt vs. Syria	Iranis vs. Baluchis	Military
Kuwait vs. Iran		
Jordan vs. Iraq		
Kuwait vs. Iraq	Sunnis vs. Shiites	Dynastic coup
Syria vs. Iraq		

* External to Arab-Israeli conflict

- Distance — Beirut is not near the oil.
- Reluctance to kill the goose that lays the golden eggs.
- Inability of untrained forces to deploy the most destructive weapons.
- Finally, sheer incompetence. We should never underestimate the ability of institutions to trip over their own underwear. This human trait has been on display in the region for centuries and can be relied upon to maintain its tradition. ■

Ontario Chapter's New Car Survey:

Little Growth in 1985; Levelling-off is Evident

"There will be little growth in the demand for cars following 1984's record year; a 'levelling off' is evident," according to Christopher Hill, corporate fleet administrator, Reichhold Ltd., and chairman of NAFA's Ontario Chapter. Hill recently conducted a new car acquisition survey among the chapter members on what vehicles they plan to order for 1985. Twenty-four fleets responded to the survey which was divided into two groups — sales and service and executive fleets.

"...the survey reveals that imports and specialty cars have low acceptance while orders for station wagons and mini-vans have increased."

The survey also reveals that four-cylinder cars are more popular than sixes in the sales/service group, while the executive group will have a choice of sixes or eights. Both the Ontario Chapter's survey and NAFA's New Car Acquisition Survey, based on its membership, revealed that imports and specialty cars have low acceptance while orders for station wagons and mini-vans have increased.

	SALES/SERVICE CARS			EXECUTIVE CARS		
	Yes	No	Haven't Decided	Yes	No	Haven't Decided
Are you planning to:						
— increase acquisitions	1	—	—	3	—	—
— decrease acquisitions	3	—	—	1	—	—
— about the same	20	—	—	17	—	—
— upsize cars	1	—	—	0	—	—
— downsize cars	3	—	2	1	—	—
— same size cars	18	—	—	15	—	—
— use:						
4 cylinder	18	—	—	4	—	—
6-cylinder	14	—	—	10	—	—
8-cylinder	1	—	—	12	—	—
Diesel	1	—	—	0	—	—
propane	0	—	—	0	—	—
turbo	0	—	—	0	—	—
Minivans:						
— use 1 or 2	6	—	—	0	—	—
— more	6	—	2	0	—	—
— none	10	—	—	16	—	—
Station Wagons:						
— use more	1	—	—	0	—	—
— less	4	—	1	0	—	—
— none	4	—	—	12	—	—
— about the same	14	—	—	5	—	—
Specialty Cars:						
— use more	3	—	—	1	—	—
— less	0	—	—	0	—	—
— none	16	—	—	12	—	—
— about the same	5	—	—	3	—	—
Imports:						
— use more	1	—	—	0	—	—
— less	0	—	1	0	—	—
— none	20	—	—	14	—	—
— about the same	2	—	—	4	—	—
Company Paid Options:						
— offer more	2	—	—	5	—	—
— less	0	—	—	0	—	—
— about the same	22	—	—	14	—	—
Employee Paid Options:						
— offer more	1	—	—	2	—	—
— less	0	—	1	0	—	—
— none	6	—	—	5	—	—
— about the same	16	—	—	11	—	—
Current Fleet:						
— mostly compact	8	—	—	0	—	—
— mostly mid-size	15	—	—	9	—	—
— mostly large	1	—	—	12	—	—

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Illinois Police Study Finds:

Fewer Accidents, Lower Without Roof-Mounted

In 1982, based on a study of fuel use and accidents, the Illinois Department of Law Enforcement began removing roof-mounted emergency lights from police patrol vehicles. Initially, 120 vehicles were used for a test, paired one with and one without roof-mounted lights. After six months, fuel economy, accidents, and productivity were compared. Significant improvements were found for those officers driving without roof-lights on their vehicles. (The 1982 study was published in the November 1983 issue of ***NAFA Bulletin****.)*

More vehicles were placed in service in early 1983. This study examines a period from April 1982 through January 1984. It examines results from 177 similar vehicles with and without roof-mounted lights that have traveled more than five million miles. Officers driving vehicles without roof-mounted lights have obtained nine percent better fuel mileage, have better productivity in speed enforcement, and have been involved in 66 percent fewer accidents. All are statistically significant. Prior to receiving these vehicles, all officers had similar performance. The findings suggest that removal of roof-mounted lights reduce costs, particularly those resulting from accidents, and improve productivity.

The data used for this evaluation was taken from three sources maintained by the Department. First is a vehicle cost file which contains monthly expenditures for fuel and maintenance, fuel used, and miles driven. Activity for officers, as well as time spent, resides in an on-line data base known as the Traffic Information and Planning System (TIPS). Finally all accidents involving officers assigned to 1982 and 1983 marked patrol cars were taken from the accident file. All data covers a period from January 1979 through January 1984.

Three statistical tests were employed to examine the following hypotheses:

1. The vehicles with roof-mounted lights have the same fuel economy as those without such lighting systems.
2. Productivity of the officers in each type of vehicle does not differ.
3. There are no differences in accident between the two types of vehicles.

Description of the Vehicles and Drivers

Since the first vehicles were placed in service in 1982, The Department of Law Enforcement (DLE) has operated 177 vehicles marked as Division of State Police (DSP) squads in line patrol. Of the 177 vehicles 93 or 52.5 percent have had grill mounted emergency lights (none on the roof). During this same period, 207 officers of the rank of Trooper have driven the vehicles

TABLE 1
Summary of Basis of Data Used for Evaluation
(Vehicles Placed in Service Since 1982)

Lighting Configuration	Number of Vehicles	Percent	Number of Officers	Percent	Miles Driven (000's)	Gasoline Used	Accidents
Roof-mounted	84	47.5%	105	50.7%	2,987.5	267,900	37
Grill-mounted*	93	52.5%	102	49.3%	2,621.2	215,900	12
Total	177	100.0%	207	100.0%	5,608.7	483,800	49

*No roof-mounted lights. All 177 vehicles are white with Illinois State Police markings.

Costs Lights

on patrol. Together, the 177 vehicles have been driven 5.6 million miles, used 48.4 thousand gallons of fuel, and been involved in 49 accidents. These data are summarized in **Table 1.**

All of the tests employed divide the officers into two categories, those driving the vehicles with roof-mounted lights (with light bars) and those driving vehicles without the roof-mounted emergency lights (without light bars). For the three measures, fuel consumption, productivity, and accidents, a separate comparison is drawn for these officers in both the new vehicles and for older marked vehicles. (All marked vehicles driven prior to 1982 had roof-mounted lights.) There are fewer officers in the historic comparison because some drove unmarked (plain color) vehicles.

The first hypothesis tested is that the fuel usage of those officers driving vehicles without light bars was no different from those officers driving vehicles with the light bars. As shown in **Table 2**, those vehicles with roof lights travelled slightly more miles but used significantly more gasoline. The most important finding is that the officers in vehicles without roof lights averaged 12.7 miles per gallon. This is 12.4 percent better than the 11.3 miles per gallon received by officers in vehicles with light bars. The difference is significant at the .0001 level. Total cost of operation, of which fuel is the largest component, was 14.2 cents per mile for vehicles with light bars and 12.5 cents per mile for those without the lights. This difference of 13.6 percent is significant at .0001.

Table 3 is the contingency table giving lighting configuration and fuel usage above and below the median of 11.8 miles per gallon. Significantly more drivers of vehicles with roof-mounted lights were below the median gas mileage. The hypothesis that fuel usage is the same for vehicles with and without roof-mounted light bars is rejected.

Did the officers drive differently before they received the new vehicles? **Table 4** shows the average gas mileage and average total costs per mile for police vehicles driven by officers. Since 1976 the officers have driven more than one vehicle; therefore, the "N" in each category does not equal the number of officers.

TABLE 2

Costs, Mileage, and Fuel Economy of The Tested Vehicles

Lighting Configuration	N	Miles Driven (000's)	Average Mileage	Gasoline Used	Average Gallons	Average Mpg*	Average Cost Per Mile (Cents)*
Roof-mounted	107	2,987.5	27,920	267,900	2503.7	11.3	14.2
Grill-mounted	102	2,621.2	25,700	215,900	2116.7	12.7	12.5
Total	209	5,608.7		483,800			
Wilcoxon significance			+1,153		+2.312 P .02	-4.775 P .0001	+4.323 P .0001

For the analysis, the officers were separated into those currently driving vehicles with and without roof-mounted emergency lighting. Because officers drove both marked and unmarked cars, the data are shown separately for each type. Although those officers currently driving vehicles without roof-mounted lights obtained slightly better gas mileage and had lower operating costs, the differences are not significant.

Other factors such as location of patrol, distance driven, or year of make are eliminated. The vehicles with and without light bars are distributed throughout the state. The first 120 vehicles were distributed randomly. Already eliminated were patrols in the urban areas surrounding Chicago. State Police patrols outside Cook County primarily are rural. While the total miles driven have differed slightly, these differences were not significant.

There are two years of vehicles in the study, 1982 Fords and 1983 Dodges. The Dodge patrol vehicles obtained 12.9 miles per gallon which was 0.4 mpg better than the Fords built in 1982. This difference was not significant.

Therefore, based on the differences in fuel mileage, 12.7 versus 11.3, the vehicles without roof-mounted lights will require less fuel to operate. If the vehicles average 15,300 miles of patrol per year, (based on data in Table 2), removal of roof-mounted lights will save 149.3 gallons of gasoline per vehicle. At 1.30 dollars per gallon, that is a savings of $194 per year per vehicle. Removal of roof-mounted lights, then, is cost-effective.

Productivity of the Officers

The officers are not expected to be more productive regardless of the vehicle driven, although, Stoica had indicated that officers driving vehicles without roof-mounted lights wrote more citations for speeding. The International Association of Chiefs of Police also had indicated in a

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Illinois Police Study

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study that police in unmarked vehicles were more effective at enforcing the 55 mph speed limit than those in marked vehicles.

While all the vehicles in this study have the traditional state police markings, those without light bars on the roof do not appear to be police vehicles, particularly to approaching motorists. Most of the officers use moving radar for enforcement of the speed limit; therefore, detection of approaching speeding motorists should be easier from police vehicles without roof-mounted lights.

On the other hand, officers in vehicles with roof-mounted lights wrote citations for other violations of a higher rate and made more stops (including those resulting in a written warning) than the other officers. However, there is no statistical difference in the rate of activity per 100 hours between the groups of officers. Those in vehicles with roof-mounted lights average 82.5 stops for all violations per 100 hours. Those in vehicles without such lights average 77.2 stops per 100 hours. An examination of activity before introduction of the new vehicles, from 1979 to 1982, showed no statistical differences between these officers even for speeding citations. Those currently driving vehicles with roof-mounted lights were slightly more productive. Therefore the hypothesis holds. There is no difference in productivity except for citing speeding motorists.

TABLE 4
Fuel Consumption By Officers Prior to 1982
(1976 to 1982)

Average Miles per Gallon

Type Vehicle Currently Driven	Marked Units Number Driven	Marked Units Average	Unmarked Units* Number Driven	Unmarked Units* Average
Roof-mounted	105	10.25	19	10.51
Grill-mounted	118	10.66	10	11.08
Wilcoxon significance		-1.254 N.S.		-0.425 N.S.

Average Total Costs of Operation

Type Vehicle Current Driven	Marked Units Average	Unmarked Units* Average
Roof-mounted	18.28	17.17
Grill-mounted	18.08	16.73
Wilcoxon significance	0.120 N.S.	0.232 N.S.

* No police markings and no roof-mounted lights.

Accidents

According to the analysis of accidents occurring to officers in 1980 (Table 5), those who drove vehicles with roof-mounted lights (all with state police markings) were twice as likely to be involved in accidents than those who drove vehicles without light bars or unmarked vehicles. For every 100 marked vehicles, 26.9 were involved in accidents. The rate for unmarked vehicles was 11.7, or one accident for every 2.3 marked vehicles. All of these vehicles had been driven for patrol and have been driven approximately similar mileage.

The null hypothesis states that no difference should exist between new vehicles with and without light bars.

Of the 49 accidents recorded from April 1982 through January 1984, 37 or 75.5 percent involved vehicles with roof-mounted lights. Twelve involved vehicles without light bars. Approximately the same number of vehicles had roof-mounted light bars as did not. As a result, the rate of accidents for vehicles with roof-mounted lights was 44 per 100 vehicles compared to 12.9 for the other vehicles. Because these data cover a 21-month period, the rate of 44.0 accidents per vehicle represent a role of 25.1 per year. This is similar to the rate for marked vehicles in 1980.

The rate of accidents over two years for vehicles without roof-

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TABLE 3
Comparison of Fuel Economy Above and Below the Median Gas Mileage (11.78 mpg)

Lighting Configuration	Below		Above		Total	
Roof-mounted	67	64.4%	38	36.9%	105	50.7%
Grill-mounted	37	35.0%	65	63.2%	102	49.3%
Total	104		103		207	

Chi-square = 15.69 d.f. = 1 p .0001

Fuel Mileage Above and Below the Median

Lighting Configuration	Miles per Gallon Below	Above
Roof-mounted	10.36	13.00
Grill-mounted	10.77	13.80
Wilcoxin significance	-1.847 p .07	-2.225 p .03

Illinois Police Study

(Continued from page 14)

mounted emergency lights was 12.9 per 100 vehicles. This difference is statistically significant at a confidence level greater than 99.9 percent. In 1980, the ratio in accidents between vehicles with roof-mounted and grill mounted lights was 2.3 to 1. This increased to 3.4 to 1 in the 1982-1983 period. The null hypothesis is rejected. Officers driving vehicles without roof-mounted lights have substantially fewer accidents.

Accident Comparison

Shown in **Table 6** is the number of accidents per million vehicle miles. There were 12.4 accidents per million vehicle miles for vehicles with roof-mounted lights and 4.6 for vehicles without such lights. Accidents involving vehicles with roof-mounted lights cost more to repair and resulted in more injuries. Only the average number of vehicles involved was similar.

The question of officer involvement in accidents prior to the issuance of new vehicles must also be considered. Were those officers now driving vehicles with roof-mounted lights involved in more accidents when they drove other cars? As shown in **Table 7**, the 207 officers were involved in 106 accidents in marked vehicles from 1976 to 1982. Even though the rate of accidents per 100 officers currently operating vehicles with roof-mounted emergency lighting is higher than for the other officers, the difference is not statistically significant. An analysis of variance for costs also showed no difference.

Major Findings

Accidents appear more likely to occur to officers driving vehicles with roof-mounted lighting equipment. These vehicles have poorer gas mileage and the officers are less productive, at least in terms of enforcement of the speed limit. Examination of fuel usage, productivity, and accidents by these officers prior to receiving the new vehicles does not indicate bias. Those driving vehicles with and without roof-mounted lighting equipment had the same history. The differences found in this study appear to be related casually to the use or lack of use of roof-mounted lighting equipment.

The findings in terms of operation costs and accidents are important. Given an average savings in fuel of 149 gallons per year means that in a fleet of 1,000 patrol vehicles at a cost of 1.30 per gallons, savings will be approximately 193,700 dollars per year. This is enough to purchase at least 19 new vehicles at the current price. Additionally, the grill-mounted and rear window lights cost less than 100 dollars installed. Aerodynamic lighting systems can exceed $300 per vehicle.

More critical is the finding in terms of reduced accidents. One of the strongest original arguments against removal of light bars was officer safety. Roof-emergency lighting was supposed to help protect the officer. Yet, the accidents involving vehicles without roof-mounted lights have resulted in no injuries to the officers driving those vehicles. On the other hand, six officers have been injured in those vehicles with the traditional lighting systems. No cost is attached to an injury for this study (and there have been too few for adequate analysis). However, any reduction in potential for injuries increases the availability of manpower, reduces out-of-pocket costs, and reduces insurance costs.

Even if injuries are not considered, the relationship in costs of repair, as a result of accidents, shows significant difference between the two sets of vehicles. The twelve vehicles without roof mounted lights cost approxi-

TABLE 5
Investment of Police Vehicles In Accidents During 1980

Type Vehicle	Accidents Number	Accidents Percent	Vehicles Number	Vehicles Percent	Rate of Accidents per 100 Vehicles
Marked	199	87.7%	741	75.6%	26.9
Unmarked	28	12.3	239	24.4	11.7
Total	227	100.0%	980	100.0%	23.2

Chi-square = 15.54 d.f. = 1 p .001

TABLE 6
Accidents Involving Vehicles With and Without Roof-Mounted Lights
Other Characteristics

Lighting Configuration	Accidents All	Accidents Police Services Excluding Patrol	Miles Driven (00's)	Accidents per One Million Vehicle Miles All	Accidents per One Million Vehicle Miles Police Services
Roof-mounted	37	11	2.987.5	12.4	3.7
Grill-mounted	12	4	2.621.2	4.6	1.5

Lighting Configuration	Average Costs	Injury to Officer None	Injury to Officer Injury	Average Vehicles Involved
Roof-mounted	$1.020	31	6	1.7
Grill-mounted	730	12	0	1.7
	N.S.	Not computed		N.S.

A Look into Why the Illinois Police Drive Without Roof-Mounted Lights

Starting in April 1982, the Illinois Department of Law Enforcement (DLE) began testing 60 marked patrol vehicles without roof-mounted emergency lights. These vehicles were selected at random from 120 marked vehicles placed in service in that year. Emergency lighting was placed inside the grill and on the back window ledge. The basis for this change was a study conducted by Stoica for the Department in 1982.[1] It recommended removal of the light bars to save fuel. It also found that drivers of unmarked cars (no roof-mounted lights) tended to have fewer accidents.[2]

The 120 marked police vehicles (squads) introduced in 1982 were divided evenly into those with and without roof-mounted emergency lights. They were distributed randomly to pairs of field officers with similar patrols in each district. In Illinois, the squad remains permanently with an officer. At the end of the first six months, the Bureau of Planning and Development evaluated the results to that point.[3]

Fuel savings, even with less than one million miles of driving, were significant. Those vehicles without roof-mounted lights averaged 6.4 percent better gas mileage.[4] Officers in all 120 vehicles had been involved in only 15 accidents, a base too small for statistical analysis. However, the accidents involving vehicles with roof-mounted lights were occurring at the rate twice that for those without lights.[5] This had been expected.

Stoica, in this study, also looked at productivity and the opinions of the officers driving the vehicles with the roof lights. There were no differences in other traffic enforcement.[6] The officers held positive opinions about their vehicles without roof-mounted lights. In terms of safety, one officer's statement suffices.

"...I personally like my semi-marked (no roof-mounted lights) squad. In fact, it has made me even more safety conscious knowing there is a possibility that I may not be seen."[7]

As a result of Stoica's interim evaluation, the Department issued most 1983 vehicles without roof-mounted emergency lights. The only location not receiving such vehicles was in the Chicago metropolitan area, a six county region.

Vehicles without light bars were not placed in the metropolitan areas. However, DLE has committed to testing the concept statewide. Tests in the urban area should be conducted similar to the test in 1982.

Footnotes

1. Ted L. Stoica, **Roof Mounted Light Systems on Police Vehicles,** Illinois Department of Law Enforcement, Springfield, IL, 1982. (unpublished)
2. **Ibid**, p. 7.
3. Ted L. Stoica. **Evaluation of Semimarked Police Vehicles,** Illinois Department of Law Enforcement, Springfield, IL, April 1983.
4. **Ibid.**, p. 3.
5. **Ibid.**, p. 8.
6. **Ibid.**, p. 10.
7. **Ibid.**, p. 20.

mately $9,000 to repair. Given the cost per accident for vehicles equipped with light-bars, these 12 vehicles would have cost more than $12,000. This is a savings of $3,000 for those accidents alone. Given the rate of accidents for vehicles without roof-mounted lights, had the other 84 vehicles also been operated with grill mounted lights, the savings would have exceeded $27,000. A summary of potential savings is shown in **Table 8**.

TABLE 7

Officer Involvement In Accidents Prior to Issue of New Vehicles

Current Vehicle Configuration	Officers in Base	Accidents in Marked Units Number	Percent	Per 100 Officers
Roof-mounted	105	57	53.8%	54.3
Grill-mounted	102	49	46.2%	48.0
	207	106	100.0%	48.0

Chi-square 1.29 d.f. = 1 N.S.

Why are the vehicles without light bars safer? The quote given earlier in this paper suggests that police officers assume that emergency lights automatically give some form of unchallenged authority. The number of times a police vehicle on an emergency call collides with another vehicle is too numerous. That authority is only assumed. When the light bars are removed, the officer has to be more cautious.

The Department has begun to issue most new vehicles with state police markings but with-

(Continued on page 35)

Get Your Cars in Shape

(Continued from page 26)

If you smell gas, the engine is probably flooded. Turn off the ignition, push the pedal to the floor for a minute, keep it there and turn the key.

Once you get the car started, don't race the engine. Warm it up briefly. Most manufacturers say that an extended warm-up is not necessary or desirable. Driving off at a moderate speed will warm your car more efficiently.

On-The-Go-Strategy

Speed: Reduce when there's snow or ice on the road increasing the risk of a skid.

Steering: Avoid abrupt steering movements to turn a corner or change lanes. Anticipate moves and steer gradually.

Braking: Apply your brakes with a slow, steady pressure until just before they lock. When you feel them nearing lockup, ease off. Pause briefly, then apply again. Keep in mind that slamming on the brakes locks them and takes away all your steering control.

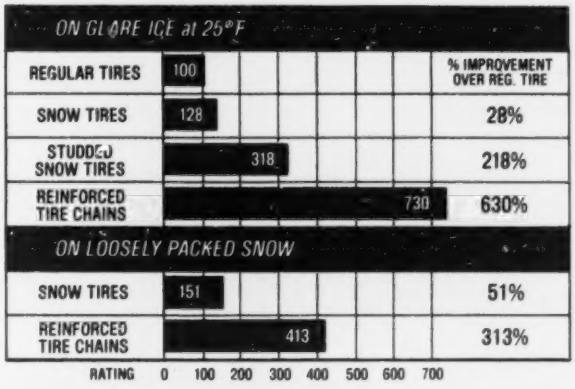
Interval: Increase your following distance when the road is snowy or icy. Doubling or tripling the normal interval is the safe way to go.

Skids: To steer out of a skid, you must take action quickly. Stay off the brakes, ease off the accelerator and steer in the direction you want the front of the car to go. If you want it to go right, turn right. If you want it to go left, turn left.

If you get stuck, turn your tires from side to side to clear away some of the snow. Then, with your tires aimed straight ahead, ease forward as gently as possible.

Another way of getting unstuck is by rocking the car. Shit from forward to reverse and vice versa, each time with just a little pressure on the accelerator, until the car gets going. ■

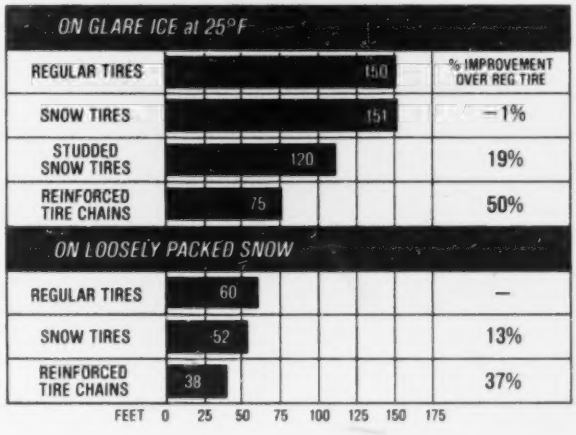
TRACTION RATING*



BRAKING DISTANCE*

FROM 20 MPH—AFTER YOU GET YOUR FOOT ON THE PEDAL

(REACTION TIME ADDS ANOTHER 22 FEET TO THE FIGURES SHOWN)



Source: National Safety Council

Illinois Police Study

(Continued from page 17)

out roof-mounted lights. If all vehicles in the patrol fleet (approximately 1,100) have no roof-mounted emergency equipment, at the estimated savings of 530 dollars per vehicle annually, (78,120 dollar savings for 21 months and 84 vehicles), the Department could save in excess of 583,000 dollars for fuel purchases and repair costs for accidents. Unknown, but also of significant importance, will be the increased availability of manpower because of reduced injuries resulting from accidents. The program has been cost beneficial. ■

TABLE 8
Potential Savings
All Vehicles
With Roof-Mounted Lights Since April 1982

Lighting Configuration	Number	Miles Driven (000's)	Gallons Used	Fuel**	Costs Accidents	Total
Roof-mounted*	84	2,987.5	246,070	$373,150	$10,030	$383,180
Grill-mounted	93	2,621.2	215,400	327,400	8,800	336,200
Potential	—	—	462,970	$700,550	$19,830	$719,380
Actual	—	—	483,800	751,000	46,500	797,500
Savings	—	—	21,830	$ 50,550	$27,670	$ 78,120

*With roof-mounted lights removed, based on costs incurred by vehicles with grill-mounted lights.

**At average actual costs of 1.55 dollars

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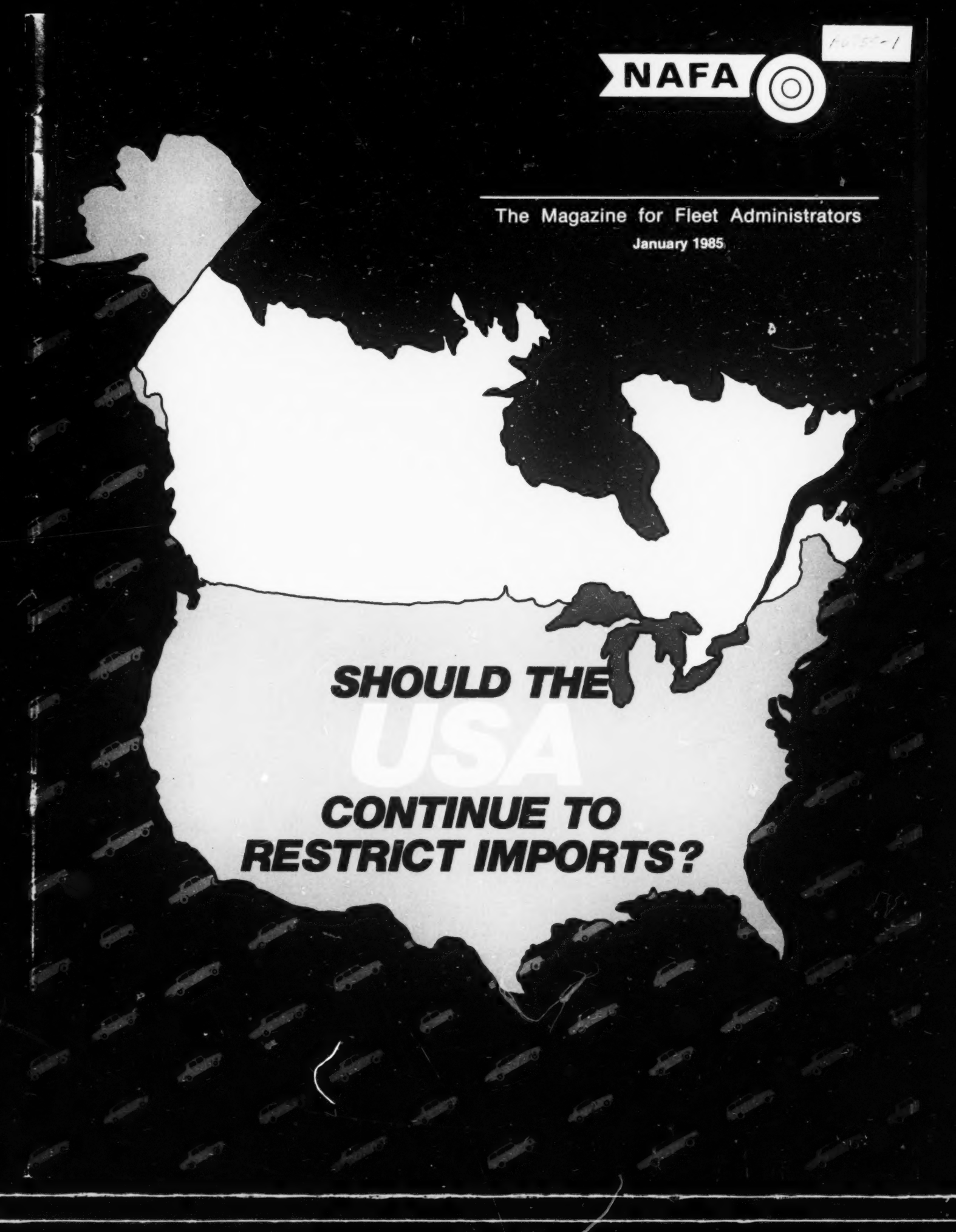

SHOULD THE USA CONTINUE TO RESTRICT IMPORTS?

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January 1985

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